

# Haolun Wu

Ph.D. candidate, Computer Science

Borealis AI 2023 Fellow

Affiliation: McGill University, Mila - Quebec AI Institute

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## Research Interests

**Areas:** Information Retrieval, Knowledge Representation, Text Mining, Trustworthy ML, LLMs

*I am broadly interested in knowledge representation, storage, and retrieval in information access systems, and also the alignment to social good.*

## Academic Training & Diplomas

2021-present **Ph.D. Computer Science**, Mila & McGill University, Montreal, Canada.

I am honored to work with my supervisory committee:

[Xue \(Steve\) Liu](#), [Fernando Diaz](#), [Laurent Charlin](#), [Joëlle Pineau](#)

*Expected graduation: 2026*

2019-2021 **M.Sc. Computer Science**, Mila & McGill University, Montreal, Canada.

Thesis: *Balancing Fairness in Multi-stakeholder Recommendation via Multi-objective Optimization*.

Published at [ACM Transactions on Information Systems \(TOIS\)](#).

2018-2018 **International Exchange**, University of California, San Diego (UCSD), San Diego, USA.

2015-2019 **B.E. Computer Science and Engineering**, Northeastern University, Shenyang, China.

Outstanding Graduation Thesis and Graduate. **Outstanding Student for all 4 years (top 1%)**.

## Relevant Industrial Experience

Aug. 2023- **Student Researcher**, Google Research, Mountain View, USA.

Feb. 2024 In **Descartes** Team.

Director: [Ray Kurzweil](#) / [Yun-hsuan Sung](#). Project Mentor: [Cicero Nogueira dos Santos](#).

- Knowledge localization in LLMs and Mixture-of-Experts (MoEs).

Feb. 2023- **Mila Research Collaborator**, Microsoft Research, Cambridge, UK.

present In **Alexandria** Team.

Manager: [John Winn](#). Project Mentor: [Bhaskar Mitra](#).

- Focus on information extraction, joint text and knowledge base (KB) masked modeling.

Nov. 2022- **Research Intern**, Google Research, Mountain View, USA.

Feb. 2023 In **MuDcATs** (*Making Decisions with Activity-based, Temporal & Sequential Data*) Team.

Manager: [Craig Boutilier](#). Project mentor: [Ofer Meshi](#).

- Propose density-based user representation (DUR) through Gaussian Process Regression, for better personalized multi-interest retrieval.

Sep. 2020- **Mila Research Collaborator**, Microsoft Research, Montreal, Canada.

Jun. 2021 In **FATE (Fairness, Accountability, Transparency, and Ethics)** Team.

Mentor: [Fernando Diaz](#).

- Propose a multi-objective optimization framework for fairness-aware recommendation, Multi-FR, that adaptively balances accuracy and fairness for various stakeholders with Pareto optimality guarantee. Paper published at [ACM Transactions on Information Systems \(TOIS\)](#) 2022.

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## **Publications** - Click [this link](#) to reach my Google Scholar profile.

### Preprint / Under-review (UR)

- arXiv - UR **Haolun Wu**, Bhaskar Mitra, Nick Craswell. “Towards Group-aware Search Success”.
- arXiv - UR **Haolun Wu**, Ofer Meshi, Masrour Zoghi, Fernando Diaz, Xue Liu, Craig Boutilier, and Maryam Karimzadehgan. “Density-based User Representation through Gaussian Process Regression for Multi-interest Personalized Retrieval”.
- arXiv - UR **Haolun Wu**\*, Ye Yuan\*, Liana Mikaelyan, Alexander Meulemans, Xue Liu, James Hensman, and Bhaskar Mitra. “Learning to Extract Structured Entities Using Large Language Models”.
- arXiv - UR Ziqiang Cui, **Haolun Wu**, Bowei He, Ji Cheng, Kede Ma, Chen Ma. “Diffusion-based Contrastive Learning for Sequential Recommendation”.
- arXiv - UR Emiliano Penaloza, Olivier Gouvert, **Haolun Wu**, Laurent Charlin. “Text Representations for Scrutable Recommendations”.
- arXiv - UR Fuyuan Lyu, Xing Tang, Dugang Liu, **Haolun Wu**, Chen Ma, Xiuqiang He, and Xue Liu. “Feature Representation Learning for Click-through Rate Prediction: A Review and New Perspectives”. arXiv:2302.02241.
- arXiv - UR Yansen Zhang, Bowei He, **Haolun Wu**, Zexu Sun and Chen Ma. “Counterfactual Multi-Player Bandits for Explainable Recommendation Diversification”.
- arXiv - UR Chengming Hu, Xuan Li, Dan Liu, **Haolun Wu**, Ju Wang, and Xi Chen. “Teacher-Student Architecture for Knowledge Learning: A Survey”. arXiv:2210.17332.

### Journal Articles

- TKDE 2024 **Haolun Wu**\*, Yansen Zhang\*, Chen Ma, Fuyuan Lyu, Bhaskar Mitra, and Xue Liu. “Result Diversification in Search and Recommendation: A Survey”. IEEE Transactions on Knowledge and Data Engineering.
- TOIS 2023 Chang Meng, Ziqi Zhao, Wei Guo, Yingxue Zhang, **Haolun Wu**, Chen Gao, Dong Li, Xiu Li, Ruiming Tang. “Coarse-to-Fine Knowledge-Enhanced Multi-Interest Learning Framework for Multi-Behavior Recommendation”. ACM Transactions on Information Systems.
- TOIS 2022 **Haolun Wu**, Chen Ma, Bhaskar Mitra, Fernando Diaz, and Xue Liu. “A Multi-objective Optimization Framework for Multi-stakeholder Fairness-aware Recommendation”. ACM Transactions on Information Systems.

### Conference Proceedings

- CHI 2024 Xiaoshan Huang, **Haolun Wu**, Xue Liu, and Susanne Lajoie. “Examining the Role of Peer Acknowledgements on Social Annotations: Unraveling the Psychological Underpinnings”. In the 41st ACM Conference on Human Factors in Computing Systems (AR: 1060/4028=26.3%). Honolulu, USA. May. 2024.
- ICLR 2024 **Haolun Wu**\*, Chengming Hu\*, Xuan Li, Chen Ma, Xi Chen, Boyu Wang, Jun Yan, and Xue Liu. “Less or More from Teacher: Exploiting Trilateral Geometry for Knowledge Distillation”. In the 12th International Conference on Learning Representations (AR: 2251/7262 = 31%). Vienna, Austria. May. 2024.

- ICDE 2023 **Haolun Wu**, Chen Ma, Yingxue Zhang, Xue Liu, and Mark Coates. “*Self-supervised Contrastive Alignment for Tag-enhanced Recommendation*”. For the 39th IEEE International Conference on Data Engineering. Anaheim, USA. Apr. 2023.
- CIKM 2022 **Haolun Wu**, Chen Ma, Yingxue Zhang, Xue Liu, and Mark Coates. “*Adapting Triplet Importance of Implicit Feedback for Personalized Recommendation*”. In the 31st ACM International Conference on Information and Knowledge Management (AR: 621/2257=27.51%. Atlanta, USA. Oct. 2022.
- SIGIR 2022 **Haolun Wu\***, Bhaskar Mitra\*, Chen Ma, Fernando Diaz, and Xue Liu. “*Joint Multisided Exposure Fairness for Recommendation*”. In the 45th International ACM SIGIR Conference on Research and Development in Information Retrieval (AR: 161/794 = 20%). Madrid, Spain. Jul. 2022.
- AAAI 2021 Chen Ma, Liheng Ma, Yingxue Zhang, **Haolun Wu**, Xue Liu, and Mark Coates. “*Knowledge-Enhanced Top-K Recommendation in Poincaré Ball*”. In the 35th AAAI Conference on Artificial Intelligence (AR: 1692/7911 = 21.4%). Virtual. Feb. 2021.
- AUTEEE 2019 **Haolun Wu**, Yunfei Feng. “*A Pioneering Scalable Self-driving Car Simulation Platform*”. In the IEEE 2nd International Conference on Automation, Electronics and Electrical Engineering. Shenyang, China. Nov. 2019.
- SMC 2018 Chong Fu, Yufu Shan, Muyang He, Ziyuan Yu, and **Haolun Wu**. “*A New Medical Image Encryption Algorithm Using Multiple 1-D Chaotic Maps*”. In the IEEE International Conference on Systems, Man, and Cybernetics. Miyazaki, Japan. Oct. 2018.
- ICCAIRO 2018 Yufu Shan, Muyang He, Ziyuan Yu, and **Haolun Wu**. “*Pixel Level Image Encryption Based on Semantic Segmentation*”. In the IEEE International Conference on Control, Artificial Intelligence, Robotics and Optimization. Prague, Czech Republic. May. 2018.

### Patents

- Patent US 2022 **Haolun Wu**, Chen Ma, Yingxue Zhang, and Mark Coates. “*Recommendation System With Adaptive Thresholds for Neighborhood Selection*”. US20220253722A1.
- IP Australia 2017 **Haolun Wu**, Haodong Lai, Yutao Liu, Wentao Zhou, and Qinlai Li. “*A Method For Real-Time Image Style Transfer Based On Conditional Generative Adversarial Networks*”. AU2017101166A4.

### Grants & Fellowships

**Total funding: \$221,000. Total share of funding: \$115,500.**

- 2023 **Borealis AI Fellowship** (\$10,000, share 100%) (1 of the 10 recipients in Canada)
- 2022 MSR-Mila Collaboration Grant (\$66,000, share 50%)  
 Lead PI: Xue (Steve) Liu; Industrial Mentor: Bhaskar Mitra, John Winn  
 Title: SNAKE: Structured Neural Attention over Knowledge base Entities  
 Funding Body: Microsoft Research
- 2022 MITACS Accelerate Fellowship (\$90,000, share 50%)  
 Lead PI: Xue (Steve) Liu; Industrial Mentor: Shuo Wang  
 Title: Fairness-aware Matching for Dynamic Predictive Behavior Matching  
 Funding Body: Bell Canada, MITACS
- 2020 MSR-Mila Collaboration Grant (\$55,000, share 50%)  
 Lead PI: Xue (Steve) Liu; Industrial Mentor: Fernando Diaz  
 Title: **Two-sided Recommendation with Fairness**  
 Funding Body: Microsoft Research

## Honors & Awards

**Total award amount: \$41,300.**

- 2023 Grad Excellence Award (\$6,000), *McGill University*
- 2023 Graduate Stimulus and Financial Supplement (\$1,750+\$1,500+\$850), *McGill University*
- 2022 Grad Excellence Award (\$7,000+\$1,000), *McGill University*
- 2022 SIGIR Student Travel Grant. (\$1,350+\$850)
- 2021 Apple Scholars PhD Fellowship Nominee (1 out of 3 students at *McGill University*)
- 2021 Grad Excellence Award (\$5,000), *McGill University*
- 2020 Grad Excellence Award (\$12,600), *McGill University*
- 2019 Excellent Graduation Thesis, *Northeastern University*
- 2016-2019 Outstanding Student (\$2,400), *Northeastern University*
- 2017 First Prize, *CUMCM (Contemporary Undergraduate Mathematical Contest in Modelling)*
- 2017 MCM/ICM Meritorious Winner, *COMAP (Consortium for Mathematics and Its Application)*
- 2016 Yao Tianshun Scholarship (\$1,000, 2 out of 250 students), *Northeastern University*
- 2014 First Prize (rank 18<sup>th</sup> in Sichuan Province), *CMS (Chinese Mathematical Association)*

## Media

- 2023 [McGill PhD Candidates Earn Borealis AI Fellowships](#). McGill Reporter.

## Community

### o Mila Lab Representatives

- I am honored to have been elected and to serve as one of the 11 [lab representatives](#) for 2023-24 at *Mila - Quebec AI Institute*, where I proudly represent the McGill PhD cohort. The Mila LabReps act as a bridge between students and the various members of Mila's ecosystem. I am actively involved in organizing student assemblies, writing newsletters, managing finances, and facilitating communication among students, professors, and staff.

### o Founder and Organizer

- I co-found and organize a reading group [DEFIRST](#) at *Mila - Quebec AI Institute* and the *Vector Institute* to build an interdisciplinary forum of researchers, students and professors alike, across both industry and academia, who work at the intersection of IR and Search, Fairness, Generative Model, and Trustworthy AI. The YouTube channel is here: <https://www.youtube.com/@defirstreadinggroup-milaxv8747/videos>.

### o Participant

- [Summer School in Responsible Artificial Intelligence \(AI\) and Human Rights](#) hosted by Mila and University of Montreal (selected as 1 of the 40 global participants).

### o Session Chair

- SIGIR 2022 (Session: Collaborative Filtering)

### o PC member / Reviewer

- ICLR 2024
- ICML 2024
- KDD 2024
- AAAI 2022
- SIGIR 2022/2023/2024
- TKDD 2022

## Talk, Lecture & Mentorship

### o Talk and Lecture

- **Teach:** "Applications of Machine Learning in Real World Systems" (COMP 597 & 598). Head: Xue (Steve) Liu. McGill University. Winter 2021 & 2022.
- **Talk:** "Multi-FR: A Multi-Objective Optimization Method for Achieving Two-sided Fairness in E-commerce Recommendation", Microsoft Bing.

Head: [Nick Craswell](#). Oct. 2021.

- **Talk:** "*Joint Multisided Exposure Fairness for Search and Recommendation*".  
(selected as 1 of the 6 contributed Talks at Montreal AI Symposium 2022)

Microsoft Bing. Apr. 2022; Bell Canada. Aug. 2022; Mila. Sep. 2022.

- o Mentored / Collaborated with several undergraduate and junior graduate students. (2022-)
  - Hillary Tao (McGill)
  - Evelyn Cao (McGill)
  - Yansen Zhang (CityU of Hong Kong)
  - Ye Yuan (McGill)
  - Rui Song (McGill)

## Coding Skills

Python, Pytorch, Tensorflow, Jax.

## Life Skills

- o I am a certificated **clarinet player**. I was a member of Musicians Association of Sichuan, China. My advisor was Yi Zhu, who is now a Deputy Director of the Music Department of Sichuan University.
- o I am also a master in **Chinese Calligraphy**. My advisor was Jialin Zheng, who is now a Vice Chairman of Sichuan Calligraphers Association and Vice Chairman of Chengdu Calligraphers Association.

## References

- o **Xue (Steve) Liu**  
Fellow of the Canadian Academy of Engineering (FCAE); Fellow of the IEEE (FIEEE)  
Professor & William Dawson Scholar  
*School of Computer Science, McGill University, Montreal, Canada*  
Associate Member, Mila - Quebec AI Institute

VP R&D, Chief Scientist / Co-Director  
*Samsung AI Center, Montreal, Canada*  
[xue.liu@mcgill.ca](mailto:xue.liu@mcgill.ca)

- o **Fernando Diaz**  
Associate Professor  
*Language Technologies Institute, Carnegie Mellon University, Pittsburgh, USA*

Research Scientist  
*Google Research, Montreal, Canada*  
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- o **Bhaskar Mitra**  
Principal Researcher  
*Microsoft Research, Cambridge, UK*  
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